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ABSTRACT

Focusing on carpentry, this module is one of eight included in the Vocational Education Readiness Test (VERT). The module begins by listing the objectives of the module and describing tools and equipment needed. The remainder of the module contains sections on manipulative skills, trade vocabulary, tool identification, trade computational skills, and measuring skills depicted as minimum competencies students should possess prior to entrance into regular secondary vocational education programs. (A users guide is also available--see note.) (LRA)

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Module 3 of the Vocational Education Readiness Test (VERT)

CARPENTRY

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CARPENTRY

Objective(s):

1. To determine student's ability to measure in inches, half-inches, quarter-inches, and eighth-inches.
2. To determine student's ability to use a 12" carpenter square.
3. To determine student's ability to use adjustable "C" clamps.
4. To determine student's ability to use a combination square.
5. To determine student's ability to use a handsaw.
6. To determine student's ability to use a handsaw and miter box.
7. To determine student's ability to use a ratchet brace with a ¼" bit.
8. To determine student's ability to screw lag bolts through drilled holes.
9. To determine student's ability to bolt two pieces of material together using lag bolts.
10. To determine student's ability to use a ratchet screwdriver/drill to drill pilot holes for wood screws.
11. To determine student's ability to use a hand drill in combination with ½" countersink.
12. To determine student's ability to use a common screwdriver to drive 1" wood screws into pilot holes and remove them.
13. To determine student's ability to use a claw hammer to drive common nails.
14. To determine student's ability to use a claw hammer to remove common nails.
15. To determine student's ability to use a torpedo level to level and plumb.
16. To determine student's ability to use a coping saw to cut angles which are not 90° in wood.

Tools Needed:

12" carpenter square

Combination square

8½" × 14" white paper

#2 lead pencils (Box)

One piece of (2" × 4" × 24") wood with paper taped across both ends of material (included in kit).

One 26" handsaw

Three adjustable "C" clamps (3" size)

Miter box (Birch, Maple, etc.)

2" × 4" scrap wood stock (30" long or longer)

1" × 4" scrap wood stock (12" long or longer)

12" plastic rule

Two 2" × 2" pieces of plywood for use with adjustable "C" clamps

Pattern for holes (One with four holes for lag bolt task and one with seven holes for countersink, etc. task)

Ratchet brace (locked ratchet)

¼" Auger bit (purchase 3 spares)

Adjustable wrench 8"

Three 3" lag bolts (5/16" diameter)

Two 2" × 4" × 30" wood stocks pre-drilled for lag bolts

Ratchet screwdriver/drill (9/64" drill point — purchase 3-4 spares)

Hand drill

Common screwdriver (with ¼" blade)

½" countersink

Box of 100 1" #8 flathead screws (purchase 1 spare box)

Claw hammer

8d common nails (purchase several lbs.)

8" Torpedo level

Level/Plumb apparatus

Coping saw with extra blades

Polygon (made from ¼" plywood)

Safety glasses - (to be worn where appropriate)

Note: See Appendices A and B for specifications for the Level-Plumb apparatus and the Polygon.

Preliminary Exercise:

The evaluator will identify a 12" plastic rule and demonstrate how to measure to the nearest inch, half-inch, quarter-inch, and eighth-inch. Answer any questions at this time; however, avoid *"teaching"* the student to measure by giving repeated demonstrations. (See Figure 1.)

Special Instructions: *Lines for Tasks 1 - 4 should measure 3", 3 1/2", 3 1/4", and 3 1/8", respectively, and should be drawn on a separate sheet of paper.*

Figure 1.

Task 1: _____*

Task 2: _____*

Task 3: _____*

Task 4: _____*

Tasks 1 through 4

Given a 12" plastic rule and measuring tasks 1, 2, 3, and 4, the student will measure the line in each task and tell his/her findings to the evaluator.

*Lines are drawn on separate sheet to respective length by evaluator.

Preliminary Exercise:

The evaluator will identify the 12" carpenter square and demonstrate how to draw a square on 8½" × 14" unruled paper. (See Figure 2.)

*Special Instructions: Have student stand to one side - **not facing you** - while you demonstrate this task.*

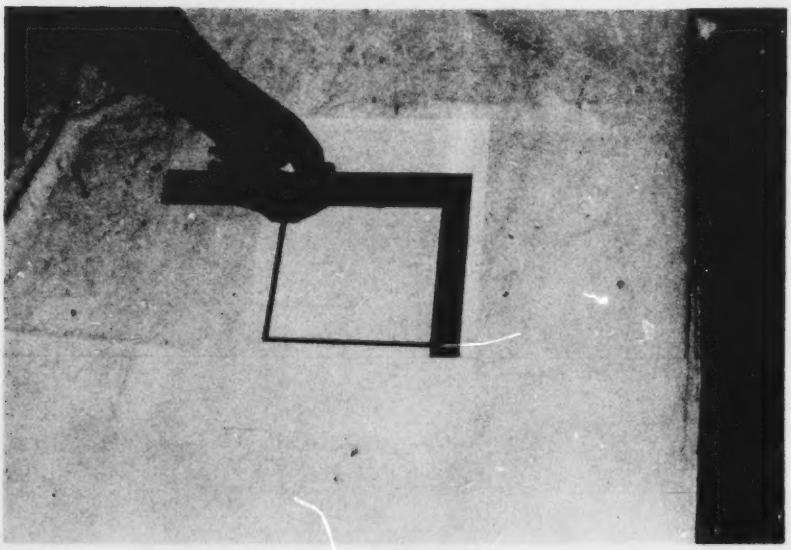


Figure 2.

Task 5

Given a 12" carpenter square and a #2 lead pencil, the student will draw a 6" x 6" square on 8½" x 14" unruled paper, to a tolerance of ⅛". **Note time!**

Preliminary Exercise:

The evaluator will demonstrate the use of the combination square as a simple cross square. (See Figure 3.)

Special Instructions: Mark (X) on paper at point where wood is to be squared by student.

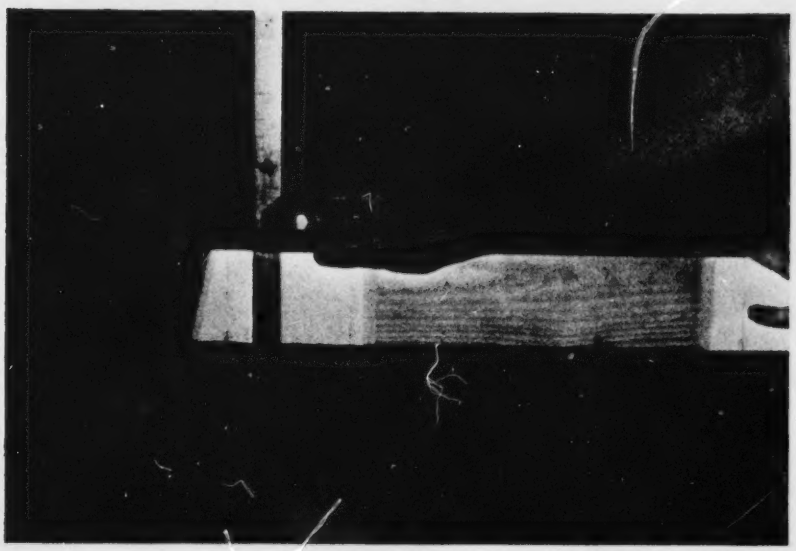


Figure 3.

Task 6

Given 2" × 4" wood stock from the kit, (paper taped on both ends) and combination square the student will square both ends (where marked by evaluator) of the wood to a tolerance of ⅛". **Note time.**

Preliminary Exercise:

The evaluator will demonstrate the use of 3" adjustable "C" clamps and 2" × 2" protective plywood strips for securing materials to be sawed. (See Figure 4.)

Special Instructions: Open each "C" clamp fully before each task and explain why you are using the 2" × 2" protective strips.

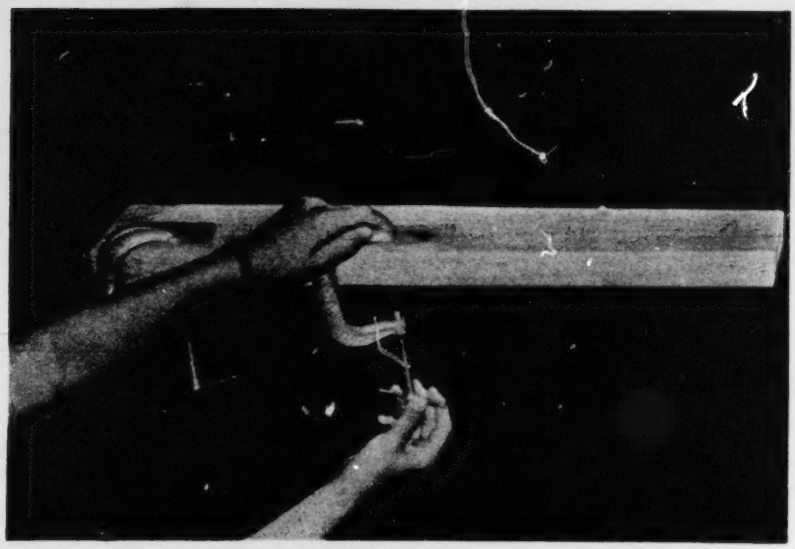


Figure 4.

Task 7

Using two adjustable 3" "C" clamps, (fully opened) two pieces of plywood (2" × 2") and 2" × 4" scrap wood stock, the student will clamp the material to a suitable table or work bench. **Note time!** (Leave clamped for Task 8.)

Preliminary Exercise:

The evaluator will identify a 26" handsaw and demonstrate for the student the techniques of starting a saw into the wood and how to saw "on-the-line." (See Figure 5.)

Special Instructions: Use combination square to draw two lines (one for preliminary exercise and one for student's task).

Figure 5.

Task 8

Given a 26" handsaw and securely clamped 2" × 4" wood stock from task 7, the student will saw "on-the-line" until the material has been sawed into two parts. **Note time!**

Preliminary Exercise:

The evaluator will explain and demonstrate the use of the miter box for sawing miter joints. (See Figure 6.)

Special Instructions: *Student will cut off end of the 1" × 4" × 30" (or longer) scrap wood stock. Evaluator will assist student by premarking the wood with the saw and placing material in miter box.*

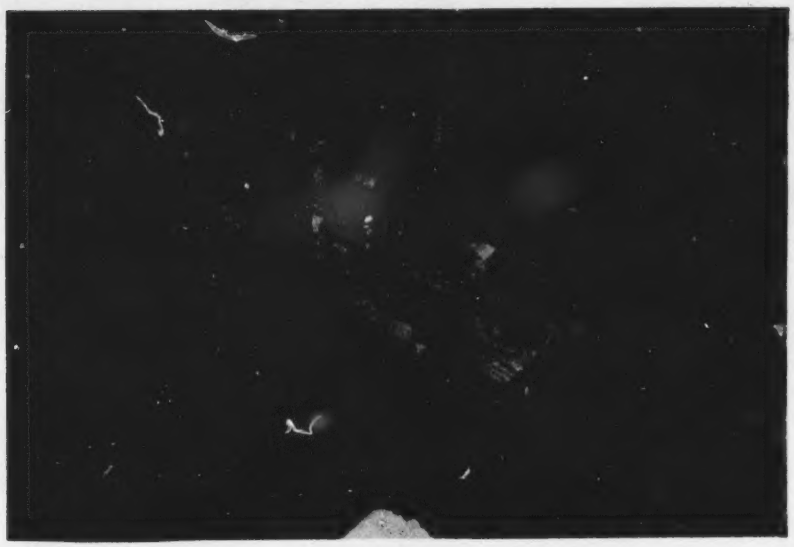


Figure 6.

Task 9

Given the miter box, handsaw, and scrap 1" × 4" wood stock (premarked) placed in miter box, the student will saw a 45° face miter. **Note time!**

Preliminary Exercise:

The evaluator will identify the ratchet brace, demonstrate how to insert the ¼" auger bit, and use it to bore a hole.(See Figure 7.)

Special Instructions: *Clamp 2" × 4" material to table with approximately 8" extending beyond edge of table. Use cardboard pattern with four premarked holes to mark where holes are to be bored. Instruct student to apply downward pressure on brace while turning clockwise. Demonstrate how to reverse ratchet brace. Time ends with bit out of last hole. Have student remove loose fitting jacket, etc., and* ***stand to the side of the evaluator*** *while task is being demonstrated.*

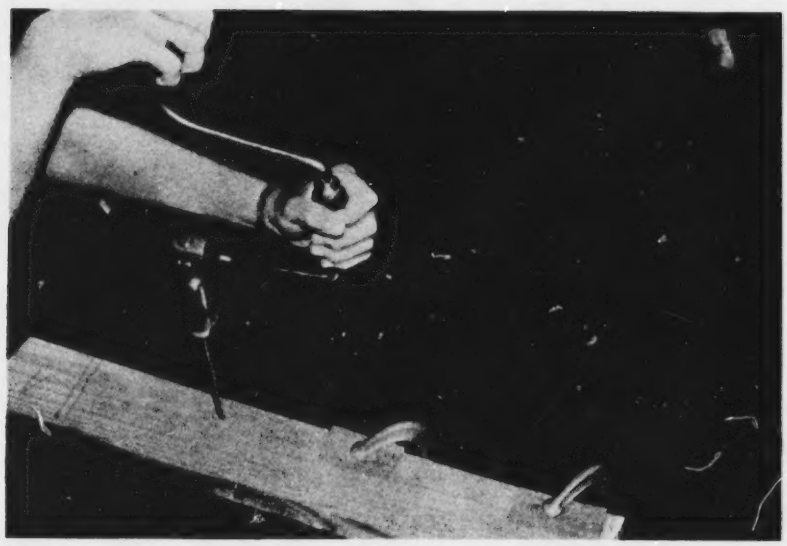


Figure 7.

Task 10

Given a ratchet brace with a ¼" auger bit inserted and secured by the evaluator, the student will bore three holes through the premarked clamped 2" × 4" material. **Note time!** (Retain bored wood for task 11.)

Preliminary Exercise:

The evaluator will identify a lag bolt and an adjustable wrench and demonstrate how to start lag bolts into a 2" × 4" wood block using an 8" adjustable wrench. (See Figure 8.)

Special Instructions: *Begin screwing bolt into wood with fingers and instruct student to do one bolt at a time. Use material from task #10 with three holes drilled*

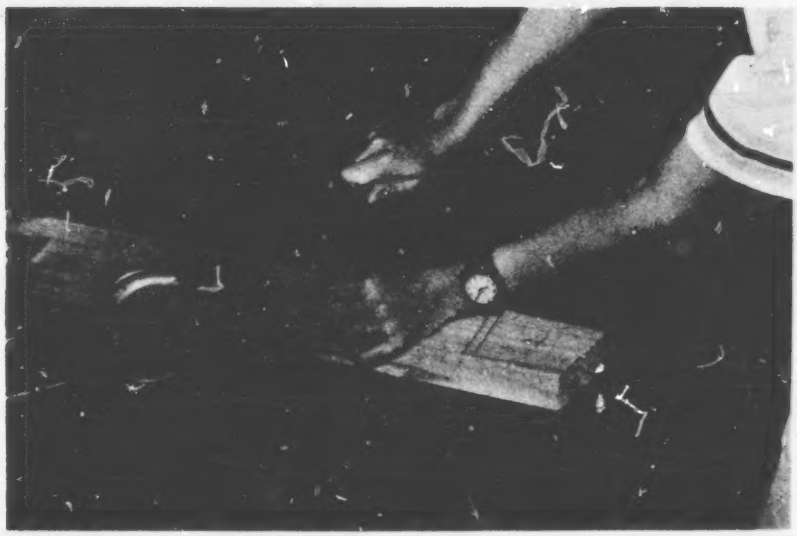


Figure 8.

Task 11

Given a 8" adjustable wrench and three lag bolts ⅜" × 3", the student will screw lag bolts (one at a time) through the drilled holes until bolt tips appear on opposite side of material. **Note time!**

Preliminary Exercise:

Using two pre-drilled 2" × 4" wood blocks from kit, the evaluator will demonstrate how to fasten them together using lag bolts. (See Figure 9.)

Special Instructions: *Instruct student to tighten bolts until heads of bolts touch wood. After this task, give student a 10-minute break. Assemble level/plumb apparatus during the break. Pre-drilled 2" × 4" wood blocks should be discarded after use by six students.*

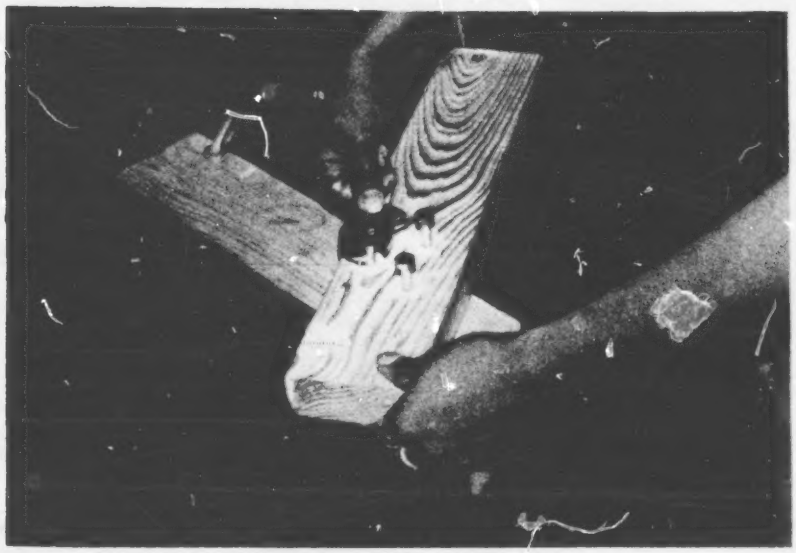


Figure 9.

Task12

Given two pieces of 2" × 4" material with holes pre-drilled (bottom piece clamped to the table), an 8" adjustable wrench, and three lag bolts, the student will match the holes and bolt the two pieces of material together until bolt heads touch the 2" × 4" material. **Note time!**

Preliminary Exercise:

The evaluator will identify the ratchet screwdriver/drill, attach the 9/64 drill point and demonstrate its use. (See Figure 10.)

Special Instructions: Use cardboard pattern with seven holes for marking the six pilot holes. The evaluator will drill a single hole for the preliminary exercise. Evaluator should clearly mark the drill bit for correct depth (approximately ¾").

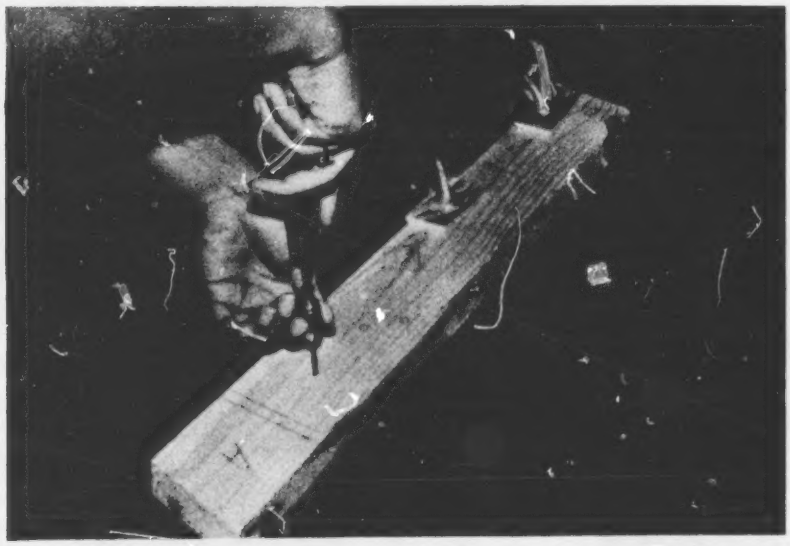


Figure 10.

Task 13

Given a ratchet screwdriver/drill, a 9/64 drill point inserted by the evaluator, the student will drill six pilot holes ¾" deep in the secured and premarked 2" × 4" material. (Save for task 14). **Note time!**

Preliminary Exercise:

The evaluator will identify the ½" countersink and hand drill, attach the countersink to the hand drill, and demonstrate how to countersink pilot holes. (See Figure 11.)

Special Instructions: Use #2 kiln dried white pine - do not mark drill sites over knots, etc.

Figure 11.

Task 14

Given a hand drill and a ½" countersink (evaluator inserts countersink), the student will countersink the six pilot holes which were drilled in Task 13. **Note time!**

Preliminary Exercise:

The evaluator will demonstrate how to drive 1" wood screws using a flat blade ¼" screwdriver. (Evaluator should check pilot holes for proper depth before student inserts screws.) (See Figure 12.)

Special Instructions: Use new screws with each student.

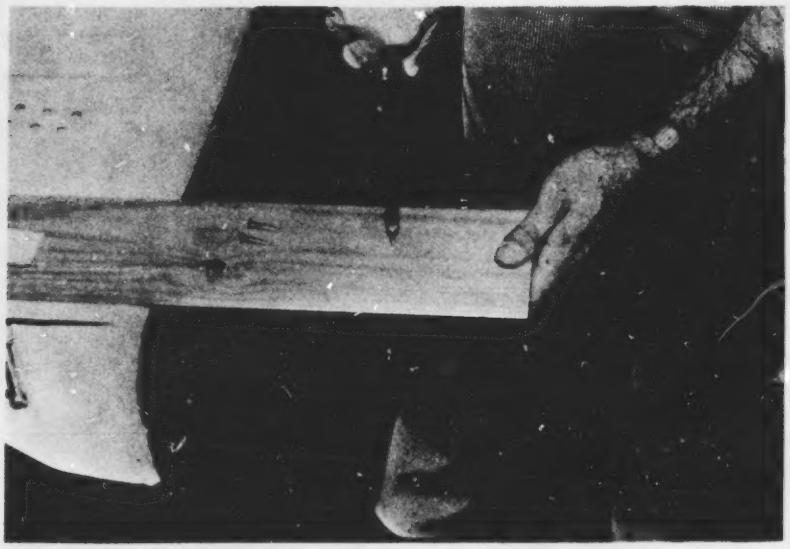


Figure 12.

Task 15

Given a flatblade ¼" screwdriver, the student will drive three 1" wood screws into three of the countersunk pilot holes until head of screw is below surface and then remove them. **Note time!**

Preliminary Exercise:

The evaluator will identify the claw hammer and demonstrate its use in driving common 8d nails. (See Figure 13.)

Special Instrucitons: *Place an "X" where each nail should be driven by the student.* **Wear safety glasses!**

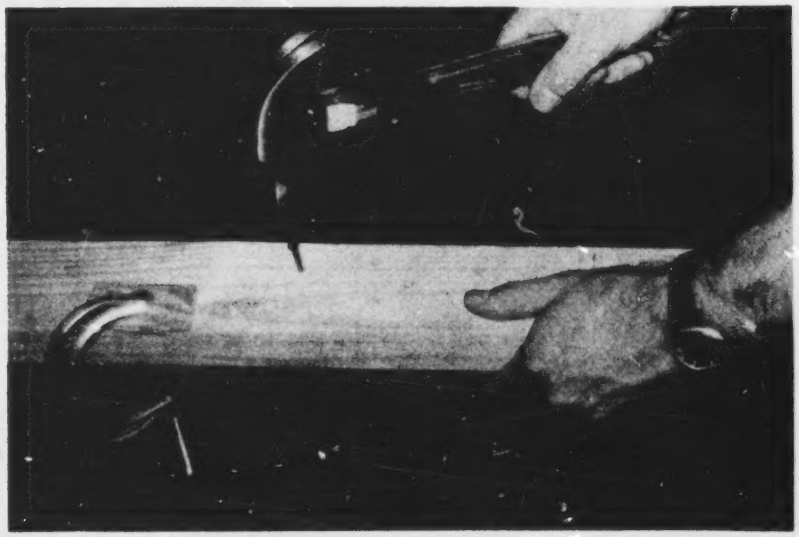


Figure 13.

Task 16

Given a claw hammer, securely clamped (scrap) 2" × 4" lumber (premarked), safety glasses, and four #8d common nails, the student will drive each nail flush into the wood. **Note time!**

Preliminary Exercise:

The evaluator will identify the claw hammer and demonstrate how to remove a common nail. (See Figure 14.)

Special Instructions: ***Have the student wear safety glasses!*** *The evaluator should drive four 8d nails into the wood until approximately 1 ' of each nail remains exposed. Use #2 white pine and do not drive nails into knots.*

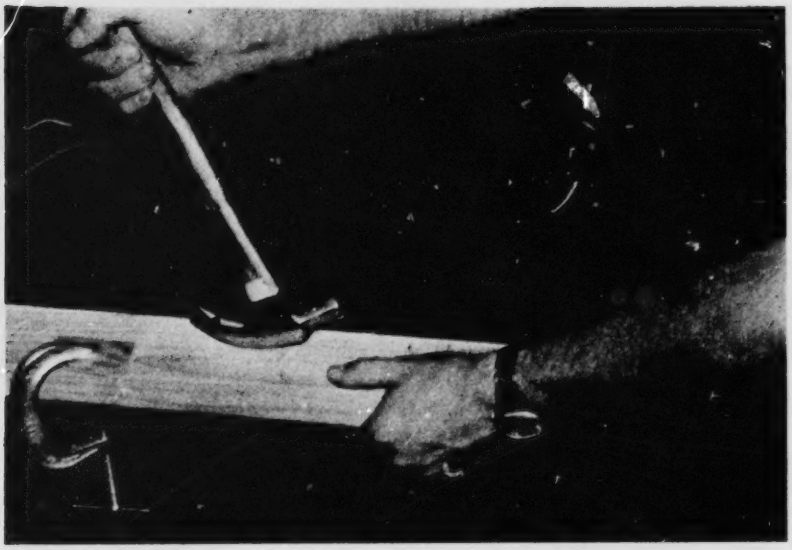


Figure 14.

Task 17

Given a claw hammer, securely clamped (scrap) 2" × 4" lumber, safety glasses, and four #8d common nails, the student will remove each nail. **Note time!**

Preliminary Exercise:

The evaluator will identify the 8" torpedo level and demonstrate how to plumb the two vertical beams and level the horizontal beam (K). (See Figure 15.)

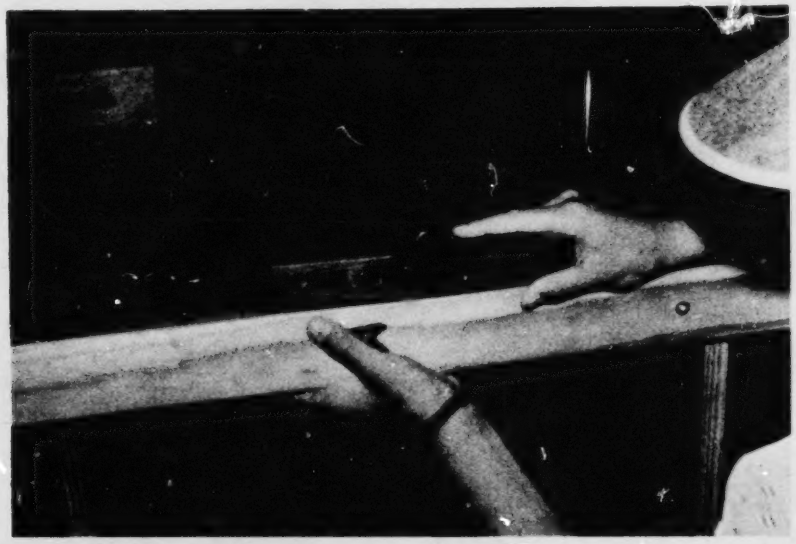


Figure 15.

Task 18

Given an 8" torpedo level and the level/plumb apparatus, the student will plumb the two vertical beams and level beam (K). **Note total time!**

Preliminary Exercise:

The evaluator will identify the coping saw and demonstrate its use for cutting intricate curves and designs in plywood. (See Figure 16.)

Special Instructions: *Polygon should be drawn on plywood with two points away from edge of table. (Use a 5" wide strip of ¼" plywood approximately 30" long and draw several polygons.)*

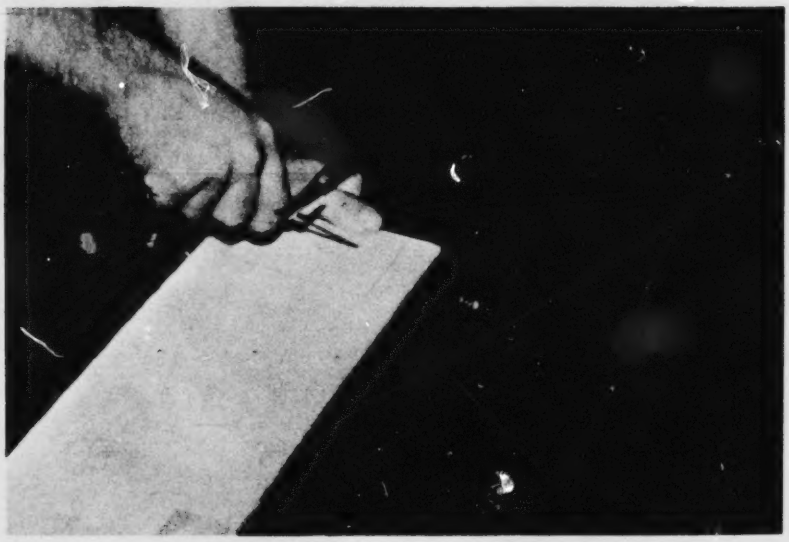


Figure 16.

Task 19

Given a coping saw and a pre-drawn polygon on ¼" plywood (clamped to the table), the student will saw polygon (premarked) and remove it from the clamped material. **Note time!**

VOCATIONAL EDUCATION READINESS TEST (VERT)
SCORING RESULTS SHEET FOR CARPENTRY

(Example Only)

Name _____

Student Performance Data

	Time*				
	Acceptable	Unacceptable	**Cut-Off Time (Seconds)		
Task 1	_____	_____	(1/2")	X	Measure-ment Skills
Task 2	_____	_____	(1/4")	X	
Task 3	_____	_____	(1/8")	X	
Task 4	_____	_____	(1/16")	X	
Task 5	_____	_____	20		
Task 6	_____	_____	40		
Task 7	_____	_____	60		
Task 8	_____	_____	100		
Task 9	_____	_____	100		
Task 10	_____	_____	125		
Task 11	_____	_____	180		
Task 12	_____	_____	100		
Task 13	_____	_____	80		
Task 14	_____	_____	190		
Task 15	_____	_____	225		
Task 16	_____	_____	60		
Task 17	_____	_____	25		
Task 18	_____	_____	50		
Task 19	_____	_____	200		

*Write N/C should student be unable to complete the task.
**These scores were arbitrarily identified and included for demonstration purposes only.

VOCABULARY FOR CARPENTRY

ABRASIVE: A rough substance that wears down another substance by means of friction.

ACOUSTICAL: Able to absorb sound waves.

ADHESIVE: Glues, etc. used to bond materials together.

ANCHORS: Devices used to give stability to one structure by securing it to another structure.

ARCH: A curved structure used to span an opening.

ARCHITECT: Person who designs and oversees the construction of a building, etc.

BEAM: A large piece of timber, iron, etc. used to support a load over an opening.

BLEMISH: Imperfect places in the finish of wood, etc.

BLUEPRINT: A working plan used by various persons on the job.

BOARD MEASURE: A system of measurement for lumber.

BRACE: Wood or other materials used as a support to stiffen some part of a structure.

BUILDING CODE: Building rules which have to be met by a builder in order for the work to be approved or accepted for payment.

CABINET: A piece of furniture fitted with shelves or drawers for holding kitchen equipment, etc.

CARPENTER: A craftsperson who builds with wood.

CEMENT: A material used to bind other materials together as stucco, etc.

CIRCUMFERENCE: The distance around a cricle.

CONTRACT: An agreement between two or more people that is written and enforceable by law.

CORRUGATED: Material with alternating ridges and grooves.

DOOR: The entranceway to a room or any structure used to close off the entrance to a room, etc.

DRESSED: Lumber after it has been planed and seasoned.

EAVES: Part of a roof which projects over a side wall.

ESTIMATING: Determining the amount of materials needed for a project.

EXTERIOR: The outside of a building.

FIBERBOARD: A building material made from wood pulp, etc., and is used for insulating buildings.

FINANCING: The process of obtaining money to pay for materials, building costs, etc.

FIRE RETARDANT: Being able to resist fire and heat.

FLEXIBLE: Materials which can be bent or changed - **pliable**.

FLUSH: To make the material level or even with other materials around it -- Placing two edges close together.

FRAME: A wooden, masonry, etc. structure designed to give shape and support.

FURRING: Using flat pieces of lumber to level a wall or ceiling.

GLAZING: Placing glass in window - a double glazed window has two thicknesses of glass for insulation.

GRADE: Refers to the ground level around a building or the quality of materials used in a building project.

GRAIN: For building purposes this term refers to the arrangement or pattern of wood fibers in lumber.

GUTTER: Metal or plastic troughs on the eaves of buildings for carrying off water.

GYPSUM: A mineral used in making gypsumboard (sheetrock) for use in drywall construction.

HAMMER: A tool used for driving and pulling nails.

HAND DRILL: A hand-operated tool used for drilling holes.

HARDBOARD: A board-type material manufactured from wood fibers pressed by hot presses.

HARDWOODS: A group of broadleaf trees such as oak, maple, pecan, etc.

HARDWARE: Metal parts used to fasten cabinets, etc. together. Includes items such as hinges, catches, lifts, locks, etc.

HEARTH: The floor of a fireplace and also the floor directly in front of the fireplace.

HEARTWOOD: The wood in the center of a log or tree.

HORIZONTAL: Somthing on a level with the horizon.

INSULATION: Any material used in construction to reduce fire hazard or to protect parts of the building from heat and cold.

JOINT: The places where two or more pieces of building materials are fitted together.

KERF: A cut made by a saw.

LAMINATED: A wood product built up in layers, as in the construction of plywood.

LINEAR MEASUREMENT: A system of measurement in length.

LUMBER: Any material such as boards, planks, or beams cut from timber to a certain size for marketing.

MANTEL: Facing around a fireplace, including the shelf across the top of the fireplace opening.

MASON: A worker skilled in laying brick or stone.

MATCHED: A wooden item exactly like another wooden item. This usually refers to matched wood grain in paneling, lumber, etc.

MEND: To repair or to make right or correct.

MODIFY: To change or alter something.

MOISTURE: Wetness that can be felt as a liquid on the surfaces of wood, etc.

MORTAR: A pasty building material used to join bricks and stones together.

NAIL: A pointed piece of metal hammered into wood or other materials as a fastener.

OFFSET: This term generally means a wall with a sunken panel or a recess of any kind.

OUT-OF-TUNE: A term which means there is a twist or irregularity in the alignment of a form, foundation, etc.

PARTICLEBOARD: A processed wood made from dry wood particles glued together under heat and pressure.

PATTERN: A model or plan to be followed

PILE: A large piece of timber driven into the ground to support a load, usually a building, bridge, etc.

PITH: The center of a log, the heart wood.

PLANE: A carpenter's tool used to make smooth wood surfaces.

PLY: One thickness of any material built of several layers such as plywood, etc.

PREFABRICATE: To construct all the parts of a house at a factory and move it to the location instead of building it by hand on the location.

PLUMB: A tool used to determine if a wall, etc., is standing up straight.

PRIMING: The first coat of paint put on for preserving wood, etc.

RAFTER: The sloping members (wood beams) of a roof which extend to the supporting walls.

REINFORCE: To strenghten by adding new materials as iron or steel rods to concrete.

RIPSAW: A saw made for cutting material with the grain.

RIGID: Something stiff or an item that will not bend.

ROOF: The top covering of a building.

ROUGHING-IN: A term used for doing the first or rough work on any part of the house, such as plumbing, walls, electrical work, etc.

SAPWOOD: The wood just beneath the bark of a tree which contains living cells and sap.

SATURATED: Full of moisture or drenched.

SAWHORSE: A frame for holding wood while it is being sawed.

SEASONED WOOD: Wood which does not contain moisture.

SHAKES: A type of handmade wooden shingles used for roofing.

SIDING: Boards used for the outside walls of buildings.

SILL: A wooden member (beam, etc.) supporting the weight of a house.

SITE: The local geographical position of a house, subdivision, etc.

STRAIGHTEDGE: A bar of wood or metal used for testing straight lines and for gauging the accuracy of work.

STUD: An upright 2" × 4" or 2" × 6" piece of lumber used in the framework of a wall.

TONGUE AND GROOVE: Lumber with a tongue cut along its edge so that it can be fitted into a groove cut into another piece of lumber.

TRUSS: A group of 2" × 4", 2" × 6", etc. arranged to form a rigid framework for supporting loads over a long span.

UPRIGHT: A piece of lumber which stands upright or vertical.

VAPOR BARRIER: Materials used to help keep moisture out of walls, floors, etc.

VENTILATION: The free circulation of air in a room or building or removing air in a room, etc., and replacing it with fresh air.

WALLBOARD: A manufacutred material used for covering walls and ceilings.

WARPED: Lumber and other materials which have been twisted out of shape.

WEATHER STRIP: Materials used around doors, windows, etc. to prevent drafts and to keep out rain and snow.

WOODWORK: The inside parts of a house such as wood molding, straircases, bookcases, etc.

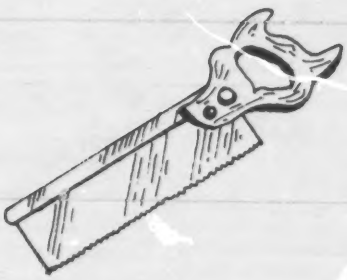
Tools for Carpentry

ROUND HEAD SCREW

OVAL HEAD SCREW

HATCHET

CARPENTER'S PENCIL



MITER SAW

DRILL CHUCK
AND KEY

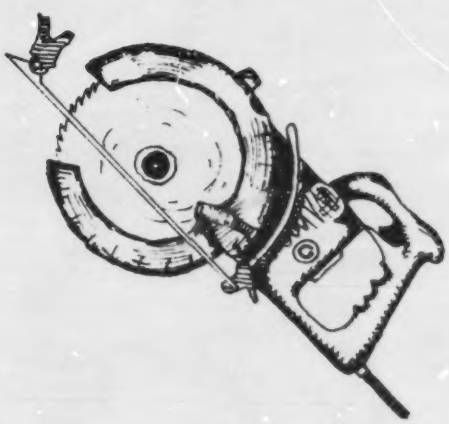
FACE SHIELD

OFFSET SCREWDRIVER

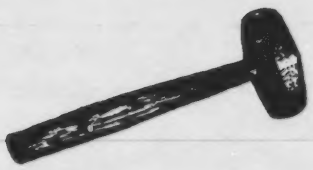
AUGER BIT

EXPANSION BIT

NAIL SET



ELECTRIC HAND SAW



SLEDGE HAMMER

RATCHET BRACE

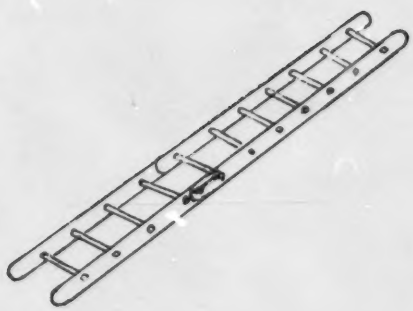
COUNTER SINK

CHUCK WRENCH

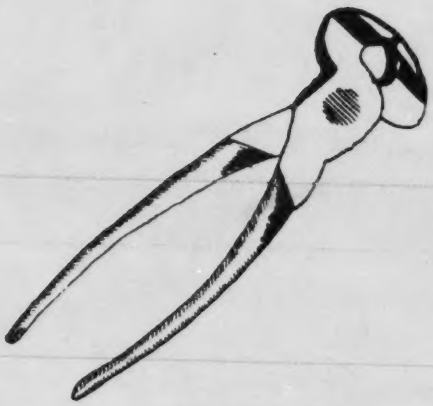
DOUBLE-BIT AXE

PUTTY KNIFE

PLUMB BOB



EXTENSION LADDER

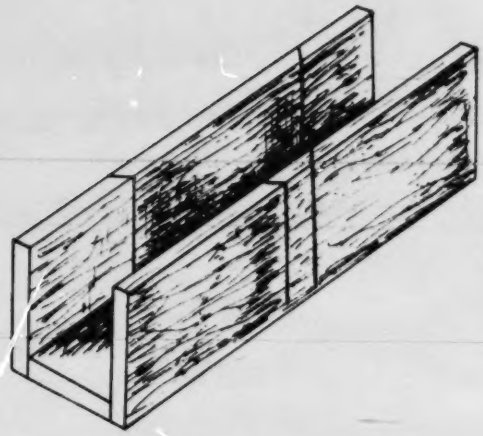


CARPENTER'S PINCHERS

MALLET

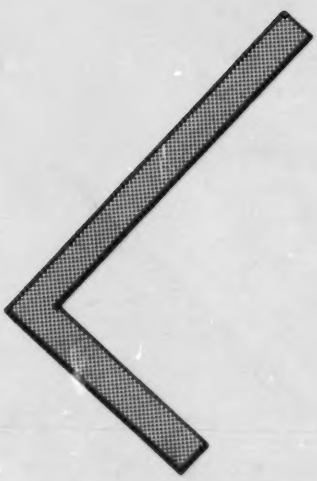
HAND DRILL

KEYHOLE SAW

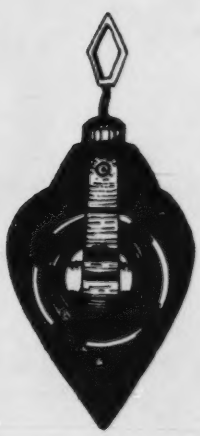


MITER BOX

STEP LADDER



FRAMING SQUARE



CHALK LINE

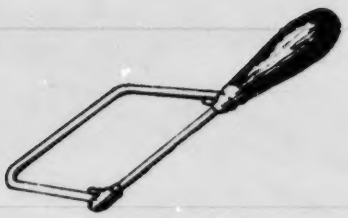
CASING NAIL

COMMON NAIL #1

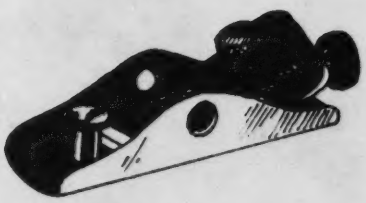
BOX NAIL

FINISH NAIL

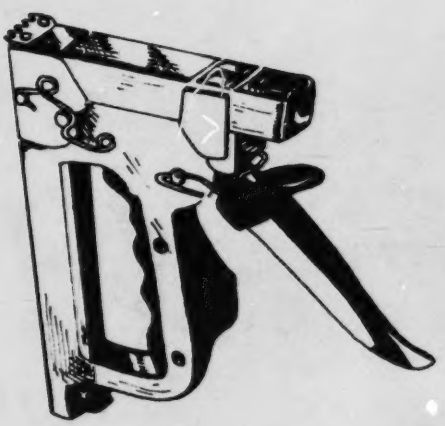
FLAT HEAD SCREW



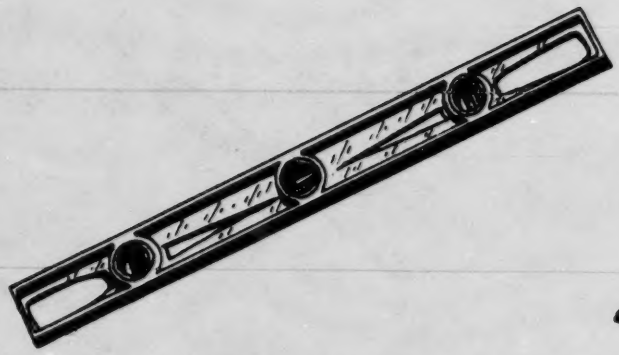
COPING SAW



BLOCK PLANE

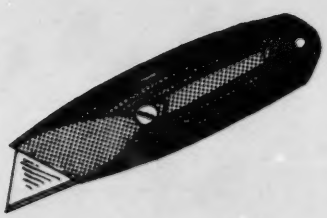


STAPLER

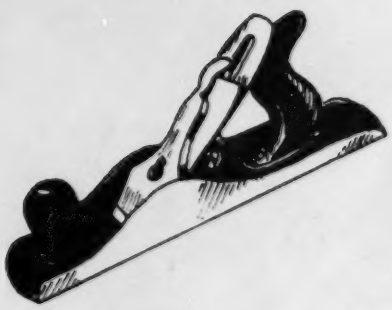


SPIRIT LEVEL

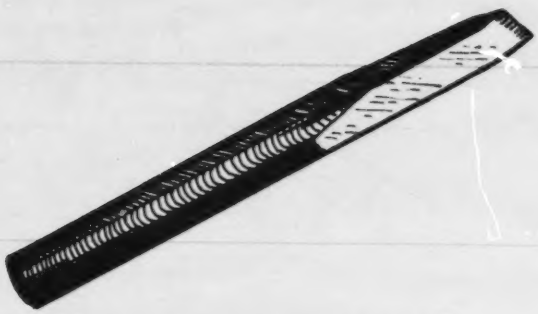
CAULKING GUN



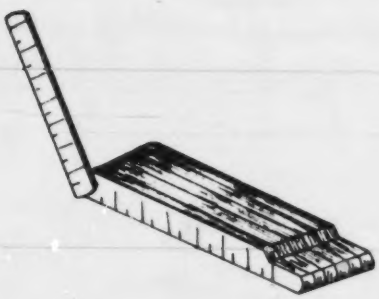
UTILITY KNIFE



JACK PLANE



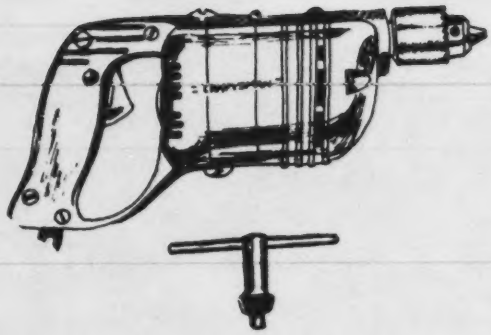
COLD CHISEL



FOLDING RULE

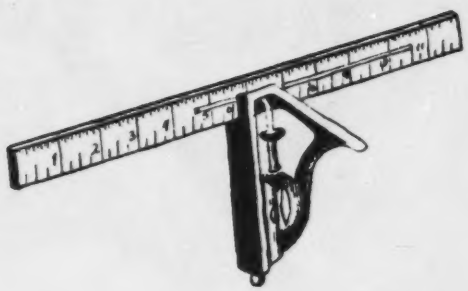
COMBINATION PLIERS

C-CLAMP

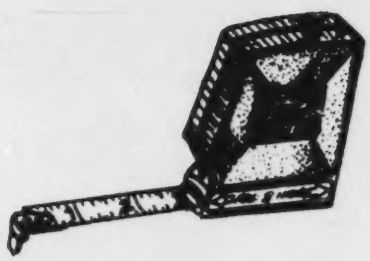


ELECTRIC DRILL

CLAW HAMMER



COMBINATION SQUARE



PUSH/PULL POCKET TAPE

RATCHET
SCREWDRIVER

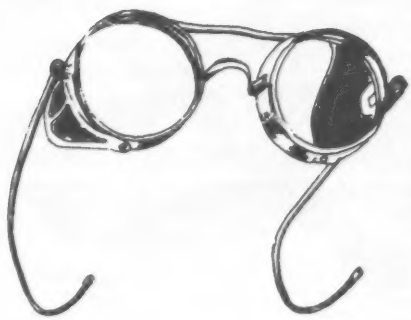
FLAT BLADE
SCREWDRIVER

PHILLIPS
SCREWDRIVER

WOOD RASP

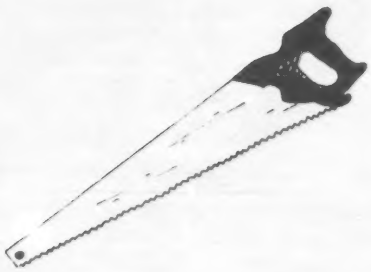
50 FT. STEEL TAPE

WRECKING BAR



SAFETY
GOGGLES/GLASSES

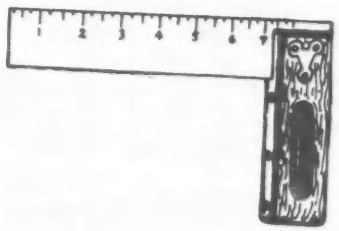
WOOD CHISEL



HANDSAW

DRAW KNIFE

SCRATCH AWL



TRY SQUARE

COMPUTATIONAL SKILLS
FOR
Carpentry

Addition:

1 1/3 +2 2/3	2 3/4 3 1/2	4 7/8 6 7/8	5 1/2 6 1/4	3 1/2 9 1/2	19 7/16 17 3/16	46 1/8 55 3/8

						56
123	2,320	12.88	1.67	.06	.92	43
56	199	11.22	.09	.07	.09	7
						19

132		
88	1/2	11 5/16
11	3/4	6 1/4
121	1/3	3 3/8

Subtraction:

18 -7	10.3 6.8	11 1/2 3 1/4	8 3/8 4 5/8	22 3/4 6 1/2	13 11/16 2 3/16

1/67	.92	23.04	16.50	112.62	110.17
.09	.09	3.97	8.51	99.73	109.79

Multiplication:

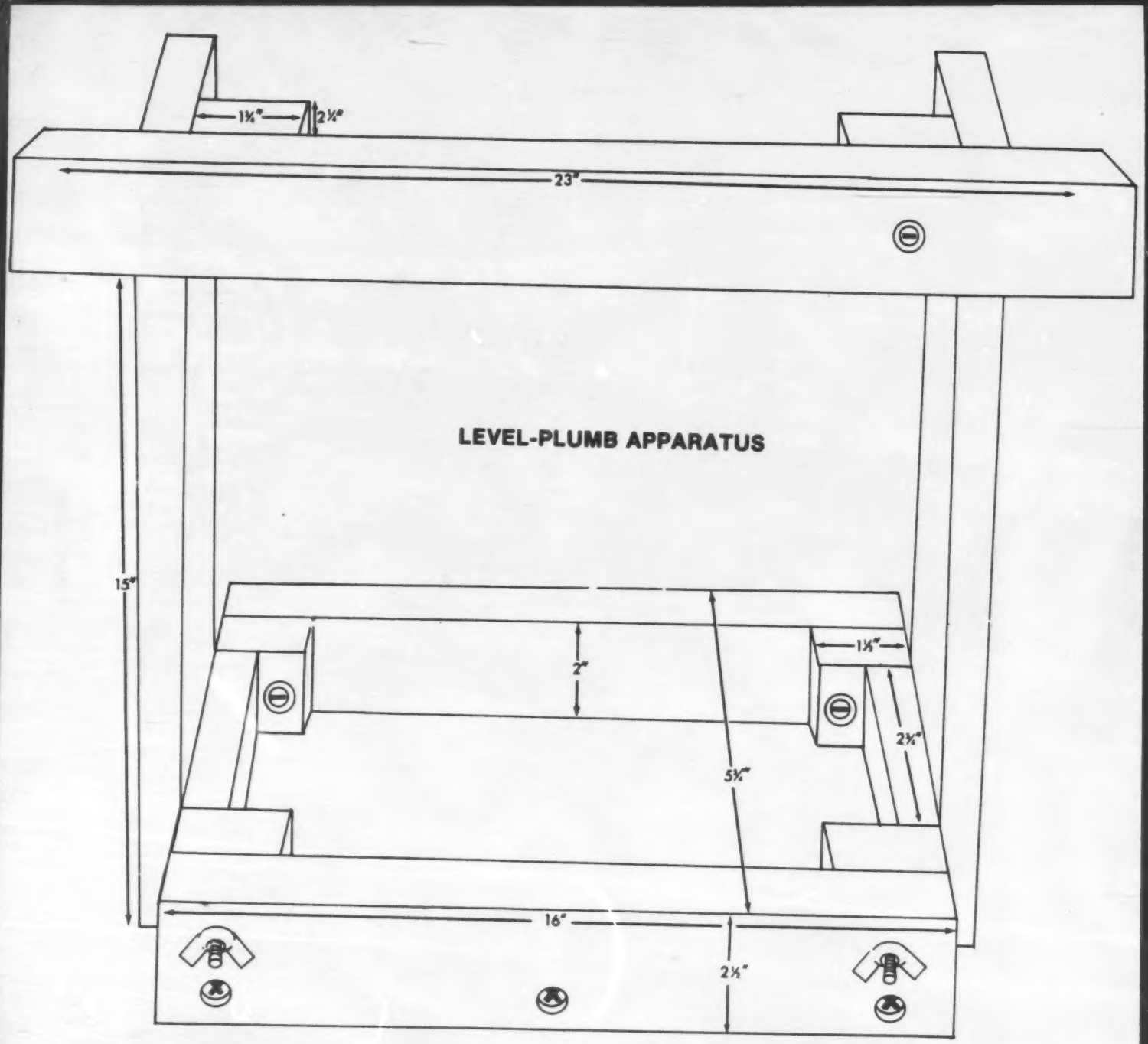
15 × 3=	2.3 ×6.8 =	1/4 × 1/2 =
22 × 22=	9.9 × 13.4 =	8 × 9.5 =
11 × 110 =	11.5 × 16 =	12 × 11 =

Division:

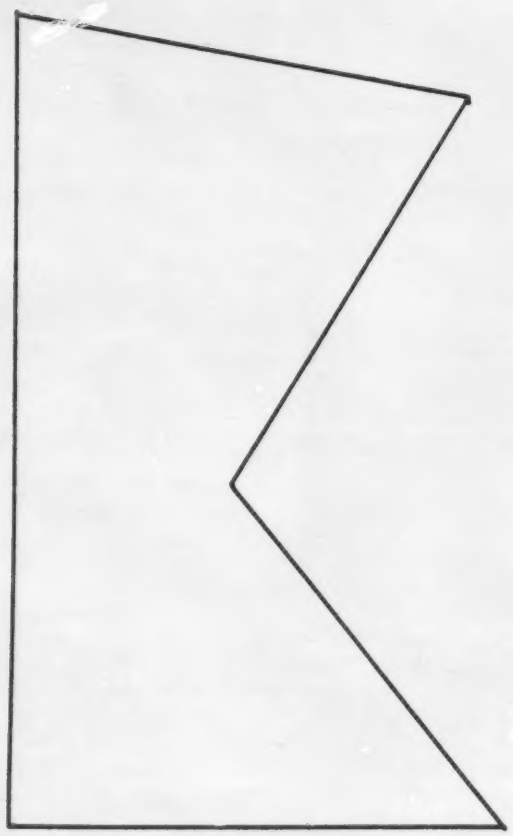
4 ÷ 2 =	129.6 ÷ 10 =	25.5 ÷ 5 =
16 ÷ 2 =	44 ÷ 12 =	25.5 ÷ 15 =
36 ÷ 6 =	116 ÷ 36 =	1080 ÷ 33 =

Reading Problems

1. Two pounds of nails cost 60 cents. How much would 5 pounds of nails cost?
2. 396 inches = _____ yards or _____ feet.
3. How many square feet are there in a wall that measures 10 feet by 12 feet?
4. Wall studs are placed every 16 inches in walls. How many studs would a 20 foot wall contain?
5. Double glazed windows (standard sizes) cost approximately $70.00 each. How much would 14 of these windows cost?
6. Roof decking on a house contains 1800 square feet of plywood. How many rolls of felt (400 square feet to the roll) will it take to cover the decking?
7. Each bundle of shingles will cover 33 square feet of roof. How many bundles of shingles will you need to buy for the 1800 square foot roof?
8. Labor costs for replacing shingles is $3.00 per bundle. How much will your labor costs be?
9. You are a carpenter's helper hired on at $4.00 an hour up to 40 hours. All over 40 hours is time and a half or $6.00 a hour. You work 46 hours, thus how much will you be paid?


1¾"
2½"
23"
15"
LEVEL-PLUMB APPARATUS
2"
1¾"
2¼"
5¾"
16"
2½"

Appendix B



Polygon
Actual Size

46